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The new potential volcanic hazard map of Guagua Pichincha Volcano, third edition 2019

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Guagua Pichincha volcano (4784m a.s.l.) is the youngest part of the Pichincha Volcanic Complex, a potentially active volcano, located on the Western Cordillera of the Ecuadorian Andes. It is a compound stratovolcano located at 12 km W of Quito (capital of Ecuador, with population of 3 million peole). The youngest eruptive center in Guagua Pichincha Volcano is Cristal Dome, which is situated on the center of a large landslide scar open to the W. Deposits of ash fall and mudflows (secondary lahars) have been found in the Quito basin, and deposits of pyroclastic flows have been identified on the western flanks.

Its most recently activity (VEI-2) occurred between 1999 and 2001 with several explosions and the consecutive formation of 9 domes, that produced ash columns that reached up to 15 km above sea level. Ash fall covered much of the capital and disrupted economic activities. Pyroclastic flows descended out to 11 km westward and flowed downvalley in the Cristal and Cinto rivers channels. Similarly, mud flows (lahars) also descended to the Cristal river valley.

Due to its proximity to Quito and its propensity to experience large explosive eruptions, a new hazard assessment has been done and three eruptive scenarios defined, representing the most important volcanic eruptions in three scenarios: eruption similar to 1999; eruption similar to 1660 and lastly, a replication of the large 10th Century eruption.

The data for each scenarios has been obtained through detailed field observations, extensive computational modeling of eruptive phenomena and new radiometric dating.

We employ VolcFlow, LaharFlow, LaharZ, Ash3D and Ballistics models in order to obtain a better approximation of the hazard limits and to define the potentially affected areas by eruptive phenomena, such as pyroclastic flows, lahars, ash fall and ballistics.

Of the eruptive scenarios the “least likely largest scenario" corresponds to the event similar to the 10th Century eruption, such as represented on the map. Combining field data, numerical simulations and information from historical records has been essential during the preparation of this newest version of the Potential Volcanic Hazards Map of Guagua Pichincha Volcano.

The data displayed of this new map is critical for hazard assessment, and it is also a guide for the territorial planning of areas potentially affected by activity from this volcano.